REMARKS

Claims 1-36 are pending in the application and stand rejected.

Objection to Claims 12, 20, and 25

Claims 12, 20, and 25 have been objected to for lacking sufficient antecedent basis within the claim for particular language. The Examiner is requiring correction. In response, Applicant has amended claims 12, 20, and 25 herein in a manner which, it contends, should overcome the objection with respect to each claim.

Rejection of Claims 1, 10, 12, 20, and 25 under 35 USC §112, Second Paragraph

Claims 1, 10, 12, 20, and 25 stand rejected under 35 USC §112, second paragraph as failing to set forth the subject matter which applicant regards as the invention. Specifically, the Examiner considers portions of these claims to be either indefinite or lack sufficient antecedent basis.

In response, these claims have also been amended. Applicant submits that the amended claims are clear and definite and urges the Examiner to remove the rejection.

Rejection of Claims 18, 19 under 35 USC §102(b) over Smith

Claims 18 and 19 stand rejected as anticipated by the Smith patent (U.S. Patent No. 4,802,143). The Examiner considers Smith to teach the claimed method for inducing seismic energy in a formation.

Applicant traverses the rejection as it might apply to the claims as amended herein. Claim 18, as amended, recites the step of determining a subsurface characteristic of the formation from detection of seismic energy imparted into the formation. The amendment is supported by the specification at least at page 2, lines 8-15, and from page 7, line 1 to page 8, line 11. The Smith reference does not disclose or suggest at least this step. Smith's device is an alarm system for a measurement-while-drilling system. It operates to

detect dangerous wellbore conditions and transmit information relating to them uphole using a pulsed telemetry technique. See e.g., Smith, col. 4, line 18-col. 5, line 11. Although Smith does teach imparting a particularly powerful telemetry signal into the drillpipe and even the formation in order to ensure that the detectors 8 and 9 receive it, that signal does not provide information relating to the subsurface characteristics of the formation. Smith's device merely detects information relating to conditions within the wellbore (i.e., a pressure "kick" that might lead to a blowout). This information is obtained during a drilling operation. The rationale behind Smith's invention is that the telemetry signal must be received clearly and without attenuation or interference. See e.g., Smith, col. 1, line 33- col. 2, line 6.

In the present invention, on the other hand, the seismic energy transmitted into the formation is detected and interpreted to provide information concerning subsurface conditions of the formation. No information relating to conditions inside the borehole is being transmitted, and such seismic interrogation of a formation typically occurs after a wellbore has been drilled. Instead of sending information relating to a condition inside the borehole, the seismic signal is used to, in essence, interrogate the formation that is surrounding the borehole. The properties of the seismic signal are altered as it propagates through the formation, and it is this information (the altered signal) that is of interest. Thus, the interference with the signal is what is important.

Additionally, Applicant disagrees that Smith discloses a surface vibratory source for vibrating the tubing string, as specified by claims 18 and 19. The Examiner points to component 10 in Smith as being the surface vibratory source that corresponds to the vibratory source 15 in the present application. However, component 10 in Smith is not a source of vibration and does not perform the same function as the recited element.

Smith's specification explains that element 10 is an "impulse telemetry transmitter; a strain gauge/radio transmitter" or an "accelerometer/transmitter." See Smith, col. 7, lines 22-24. The function of this component is to transmit information to Smith's "Pipe Strain Signature Detector." See Smith, col. 7, lines 32-40; Figure 8. The transmitter 10 does not vibrate the drill string. Those means in Smith that actually vibrate the drill string or actuate the "anchor" are, in fact, located downhole. See, e.g., Smith, col. 12, line 10-col. 13, line 60 and Figures 2, 3, and 6. Thus, Smith does not reveal or suggest at least the element of a surface based vibratory source, as recited by claims 18-19.

The Examiner is urged to remove the rejection.

Rejection of Claim 20 under 35 USC §103(a) over Smith and Nelson

Claim 20 has been rejected for obviousness over a combination of the Smith patent and U.S. Patent No. 4,188,610 issued to Nelson. The Examiner contends that Smith teaches the subject matter of claim 20 with the exception of teaching the operation of the vibratory source with a control unit according to programmed instructions and in response to a sensed parameter of interest. She contends that Nelson, however teaches controlling the frequency of the vibratory source with a control unit (Fig. 21 of Nelson) with a controller having preprogrammed instructions and in response to a sensed parameter of interest. She concludes that it would have been obvious to one of skill in the art to modify the method taught by Smith to control the frequency of the vibratory source in response to a sensed parameter of interest.

Applicant traverses the rejection. Applicant incorporates herein the arguments made previously with respect to the inability of Smith to anticipate claims 18 and 19. Claim 20 should be allowable at least as depending from an allowable claim 18. Additionally, however, Applicant submits that the proposed combination of Smith with Nelson is

improper. First, there is no motivation or suggestion present in the cited art of record for making the combination that the Examiner suggests. Smith, as noted above, relates to the art of measurement-while-drilling systems and the problems that relate to mud-pulse telemetry of MWD data. Nelson, on the other hand, deals with the geophysical exploration. There is no reason indicated as to why one of skill in the art would wish to combine these two relatively disparate references.

Second, Applicant submits that a combination of Smith with Nelson cannot be an obvious modification since it would materially change the principle of operation of Smith's system and, as a result, destroy its ability to function for Smith's intended purpose. As a rule, it is improper to modify a reference where the modification would change the principle of operation of the prior art invention being modified. See MPEP §2143.01; In re Ratti, 270 F.2d 810 (CCPA 1959). It is also improper to modify a reference if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose. See MPEP §2143.01; In re Gordon, 733 F.2d 900 (Fed. Cir. 1984). In the present case, the modification that the Examiner is proposing would both change the principle of operation of Smith's device and destroy its ability to function for its intended purpose. If one were to transmit seismic energy pulses to be transmitted through the formation they would be unsuitable for transmitting pulsed data relating to the presence or absence of a dangerous wellbore condition.

Rejection of Claims 1-8, 12, 13, 15-17, 23, 24, 26 and 33-36 under 35 USC §103(a) over Smith and Cretin

Claims 1-8, 12, 13, 15-17, 23, 24, 26 and 33-36 each stand rejected for obviousness over a combination of the Smith and Cretin references. The Examiner contends that Smith

teaches the invention claimed in independent claims 1, 12, and 23 with the exception of an anchor device engaged with the borehole at a selected location. However, she considers Cretin to teach an anchor device that is engaged with the borehole at a selected location. She concludes that it would have been obvious to one of skill in the art to modify the apparatus taught by Smith to make the anchor device engaged with the borehole, as Cretin teaches in order to obtain the advantage of secure fastening of the apparatus to the borehole while seismic energy is being transmitted. The Examiner further considers Smith to teach each of the elements within the dependent claims.

Applicant traverses the rejection. Again, Applicant points out that the claims have been amended herein and that, as amended, the subject matter of the claims is not obvious in view of Smith in combination with the Cretin patent. Claim 1 (as well as dependent claims 2-7) recites an apparatus wherein the anchor transmits seismic energy into the formation as well as a control unit for determining a subsurface characteristic of the formation from detection of such seismic energy. Independent claim 12 (and dependent claims 13 and 15-17) recite an anchor to induce seismic energy into the formation and a detector placed spaced-apart from the anchor to detect seismic signals that are responsive to the seismic energy that is induced by the anchor. Independent claims 18 and 23 (as well as dependent claims 24, 26, and 33-36) recite imparting seismic energy through the anchor to the formation and determining a subsurface characteristic of the formation from detection of the seismic energy. Applicant submits that, even if one of skill in the art were to combine the references that the Examiner has cited, it would not reveal the claimed invention. Neither of the cited references, alone or in combination, teaches transmitting seismic energy from the anchor and upon receiving that energy, determining a subsurface characteristic of the formation. As noted, Smith does not disclose or suggest transmitting

"seismic energy" into the formation from an anchor, as required by the claims, nor does it teach the step of determining a subsurface characteristic of the formation from such energy. Cretin also does not disclose or suggest an anchor transmitting seismic energy into the formation. In Cretin, a seismic signal is transmitted from the surface, specifically from seismic source 14. The anchored equipment in the borehole is merely a receiver for the transmitted seismic energy. See Cretin, col. 3, lines 55-57 and col. 4, lines 14-17.

Rejection of Claims 9-11, 14, 17, 20, and 25 under 35 USC §103(a) over Smith, Cretin and Nelson

Claims 9-11, 14, 17, 20, and 25 stand rejected for obviousness over a combination of the Smith, Cretin and Nelson references. The Examiner applies Smith and Cretin, in combination, to claims 1, 12 and 23, as discussed above, and further applies the Nelson reference. Principally, the Examiner considers Nelson to teach the elements of a computer as the control unit (claim 9), controlling the vibratory source in response to a sensed parameter (claim 10), programmed instructions (claim 11), use of a detector for the control unit (claims 14 and 25), and so forth. He concludes that it would have been obvious for one of skill in the art to modify the system taught by Smith and Cretin to control the vibratory source in response to detected signals, as taught by Nelson.

Applicant traverses the rejection. Applicant incorporates herein the arguments made above with respect to independent claims 1, 12, and 23 and Smith and Cretin to render these claims unpatentable. Applicant submits that claims 9-11, 14, 17, 20, and 25 should be patentable at least as depending from allowable base claims.

CONCLUSION

In accordance with the recent amendments to 37 CFR §1.121, Applicant is including clean copies of the amended claims within the text of this response. A marked-up version of the amended claims showing the changes made is attached hereto.

The Commissioner is hereby authorized to charge any fees deemed necessary for this response to **Deposit Account No. 13-0010 (284-15718-US)** maintained by Madan, Mossman & Sriram. The Examiner is invited to discuss this matter with Applicant's attorneys should any questions arise.

Respectfully submitted,

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MARKED-UP VERSION OF AMENDMENTS SHOWING CHANGES MADE

In th Claims:

1. (First Amended) An apparatus for [inducing seismic energy in]determining a subsurface characteristic of a formation penetrated by a [borehole]wellbore, comprising:

- an anchor device engaged with the [borehole]wellbore at a selected location; [and]
- a vibratory source at a surface location coupled to the anchor causing the anchor to impart seismic energy into the formation; and
- a control unit for control of the vibratory source and for determining a subsurface characteristic of the formation from detection of said seismic energy imparted into the formation.

9. The apparatus of claim [8]1, wherein the control unit includes a computer.

10. (First Amended) The apparatus of claim [8]1, wherein the control unit controls frequency of [operation]vibration in the vibratory source in response to the sensed parameter of interest.

11. (First Amended) The apparatus of claim 10, wherein the control unit controls frequency of vibration in accordance with programmed instructions provided to the control unit.

12. (First Amended) A system for obtaining seismic data relating to a formation, comprising:

- an anchor device engaged with [the borehole]a wellbore at a selected location; [and]
- a vibratory source at a surface location coupled to the anchor causing the anchor to induce seismic energy into the formation[.]; and
- at least one detector placed spaced-apart from the anchor, to detect seismic signals responsive to [the] seismic energy imparted in the formation by the anchor.

17. (First Amended) The system of claim [12]13, wherein said control unit processes the signals detected by at least one detector.

18. (First Amended) A method for inducing seismic energy in a formation penetrated by a [borehole]wellbore, comprising:

- coupling a tubular string between a downhole anchor and a surface vibratory source;
- vibrating the tubing string to generate a seismic wave in the formation at the anchor; and
- determining a subsurface characteristic of the formation from detection of said seismic energy imparted into the formation.

20. (First Amended) The method of claim 19 further comprising controlling [the] frequency of operation of the vibratory source with a control unit, said control unit having a

processor acting according to programmed instructions, said control unit controlling the frequency of the vibratory source in response to the sensed parameters of interest.

23. (First Amended) A method for obtaining seismic data, comprising:

- engaging an anchor in a wellbore in a subsurface formation at a selected downhole location;
- coupling the anchor to a surface located vibratory source;
- energizing the vibratory source to impart seismic energy through the anchor to the formation; [and]
- sensing the seismic energy by at least one detector spaced-apart from the anchor; and
- determining a subsurface characteristic of the formation from detection of said seismic energy imparted into the formation.

25. (First Amended) The method of claim 23, further comprising controlling the vibratory source with a control unit in response to [the] signals sensed by the at least one detector.